

BULLETIN

OF THE INSTITUTE OF METALS

VOLUME 6

OCTOBER 1961

PART 2

INSTITUTE NEWS

Election of Members

The following 17 Ordinary Members, 3 Junior Members, and 5 Student Members were elected on 1 September 1961:

As Ordinary Members

- ARENA, Salvador, President, Termone-Canica São Paulo S.A., Caixa Postal 8169, São Paulo, Brazil.
- BOOTMAN, Hedley, A.I.M., Works Director, Lead and Alloys, Ltd., London, S.E.2.
- DUNCAN, William Barr McKinnon, B.Sc., Division Director and Chief Engineer, Imperial Chemical Industries, Ltd., Billingham Division, Billingham, Co. Durham.
- EDSTRAND, K. R., Managing Director, Broderna Edstrand A.B., P.O. Box 283, Malmö, Sweden.
- FOROUD, Abdol Karim, Dr. Phys. Chem., Project Engineer, Research and Development Department, Metals and Controls Inc., Attleboro, Mass., U.S.A.
- GUESS, Charles George, Lecturer in Metallurgy, Reading Technical College, Reading, Berks.
- HART, Charles W., B.S., Republic Steel Corporation, Buffalo 3, N.Y., U.S.A.
- JEYASINGH, Asirvatham Paramanandadas, Technical Representative, A. Simpson and Co., Ltd., c/o The Indian Standard Metal Co., Ltd., Bombay 27, India.
- LAKE, William Henry George, O.B.E., B.Sc., Ph.D., Joint Managing Director, Imperial Chemical Industries, Ltd., Metals Division, Birmingham 6.
- MCLAUGHLIN, Robert J., B.M.E., Director, Sales and Service, Fortex Products, Inc., Milwaukee 12, Wis., U.S.A.
- MOXON, Arthur Leslie, B.S., Chief Plant Metallurgist, Reynolds Metals Company, Brookfield, Ill., U.S.A.
- NETTLES, William Robertson, Jr., B.S., Remelt and Casting Metallurgist, Olin Mathieson Chemical Corp., Hannibal, Ohio, U.S.A.
- NIELSEN, Peter Nørgard, M.Sc., Metallurgist, Nordiske Kabel- og Traadfabriker, Copenhagen F, Denmark.
- ROWE, Francis Darrell, Works Metallurgist, Metalex Pty., Ltd., P.O. Box 32, Oakleigh, Vic., Australia.
- SMITH, Maurice Joy, O.B.E., B.Sc., Manager, Technical Department, Enfield Rolling Mills, Ltd., Enfield, Middlesex.
- VALVERDE CASTILLA, Luis Fernando, Ing.Ind., Ingeniero Jefe de la Fundicion de Laton y Bronces, y de la Fundicion de Aleaciones Ligeras, Sociedad Espanola de Construcciones Electromecanicas, Cordoba, Spain.
- WILLIAMS, Llewelyn John, Technical Manager, Dürerer Metallwerke A.G., Luedenscheid, Germany.

As Junior Members

- BURT, Vincent Robin, B.Sc., Assistant Metallurgist, Page Hersey Tubes, Ltd., Welland, Ont., Canada.
- AL KHAZRAJI, Ahmad Thannun Hussain, B.Sc., Iraq Petroleum Co., Ltd., Mosul, Iraq.
- KLEINEDLER, Gary Evan, B.S., M.S.E., Metallurgical Engineer, Princeton Research Centre, Western Electric Co., Princeton, N.J., U.S.A.

As Student Members

- BUTLER, Michael John, B.Sc., A.R.S.M., Technical Representative, Industrie-Technik, Verkaufs G.m.b.H., Vienna I, Austria.
- JOHNSON, Harland E., B.Sc., Postgraduate Student, Department of Mining and Metallurgy, University of Alberta, Edmonton, Alberta, Canada.
- MURTY, Gollapudy Satyanarayana, B.Sc., B.E., Research Assistant, Department of Metallurgy, University of California, Berkeley 4, Calif., U.S.A.
- ROY, Upendra, B.Sc., Student, Department of Metallurgy, University of Sheffield.
- SARGENT, Colin Michael, B.A., Research Student, Department of Metallurgy, University of Cambridge.

PERSONAL NOTES

MR. A. M. BAER has been appointed Chairman of Consolidated Zinc Corporation, Ltd., in succession to the late Mr. L. B. Robinson. He has also been appointed Chairman of New Broken Hill Consolidated.

DR. J. D. BAIRD has left the National Physical Laboratory to become Head of the Metal Physics Division in the Central Research Department of Colvilles, Ltd., Motherwell.

MR. J. V. BIRNIE is now Deputy Metallurgist-in-Charge of the Manor Road Materials Laboratories of The de Havilland Aircraft Co., Ltd., Hatfield. He was previously at the Company's Lostock works, Bolton.

MR. A. BURWOOD-SMITH has left the International Nickel Co. (Mond), Ltd., Acton, and is now with Vandervell Products, Ltd., Maidenhead.

MR. J. G. CAMPBELL has left the Hawker Siddeley Nuclear Power Co., Ltd., to take up an appointment as Technical Applications Engineer with Morganite Carbon, Ltd.

DR. L. A. CARAPPELLA is now with General Dynamics, Electronics Research Division, Rochester, N.Y.

PERSONAL NOTES

MR. G. J. CATTERALL has been appointed Chief Metallurgist at T. J. Brooks (Leicester), Ltd., the Aircraft Fastener Division of the Guest, Keen and Nettlefold Group.

MR. A. K. DAS is now in the Rolling Mill Office of the Durgapur Steel Project, West Bengal.

MR. R. J. DEAN has taken up a post with Alcan Industries, Ltd., Banbury.

DR. J. P. DENNISON has been appointed Senior Lecturer in the Department of Metallurgy at University College, Swansea.

MR. J. M. DRAYSEY is a management trainee with Tube Investments, Ltd.

DR. U. R. EVANS has been awarded the honorary degree of D.Met. by Sheffield University.

MR. R. P. HARRISON has left Manchester University and is now engaged on post-graduate research at Imperial College, London.

DR. V. J. D. HILL has returned to England from South Africa and his address is now c/o The British Oxygen Co., Ltd., Bridgewater House, Cleveland Row, London, S.W.1.

MR. R. P. HOSE has been appointed Rod Mill Metallurgist at the brass rod and wire mill of Austral Bronze Co., Melbourne. He was previously at the Company's works at Glenorchy, Tasmania.

DR. B. W. HOWLETT has left the Massachusetts Institute of Technology to take up a Senior Fellowship at the Atomic Energy Research Establishment, Harwell.

PROFESSOR M. C. HUFFSTUTLER, Jr., is now at the University of Texas, Austin, Texas.

MR. R. A. JARMAN has left Standard Telephones and Cables, Ltd., and is now at Applied Electronics Laboratories, Portsmouth.

DR. IVOR JENKINS has been appointed Director of Metallurgical Research to The Manganese Bronze and Brass Co., Ltd., and its subsidiaries. He has been Chief Metallurgist at the Research Laboratories of the General Electric Co., Ltd., for a number of years.

DR. T.-S. LIU has joined the staff of the Minneapolis-Honeywell Regulator Co., Research Centre, Hopkins, Minn.

MR. C. M. LYNE has left Henry Wiggin and Co., Ltd., to take up an appointment with the Jones and Laughlin Steel Corp., Aliquippa, Pa.

MR. M. F. MARCHBANKS has left the Missouri School of Mining and Metallurgy at Rolla, Mo., and is now a staff member at the University of California's Los Alamos Scientific Laboratory, Los Alamos, N.M.

PROFESSOR I. OBINATA, Director of the Research Institute for Iron, Steel, and Other Metals, Tohoku University, has been elected President of the Japan Institute of Metals.

MR. R. N. PARBAT has left the Battersea College of Technology to join the Metallurgical Research and Technical Development Department of Stewarts and Lloyds, Ltd., Corby.

DR. S. J. S. PARRY is now at the Research Laboratories of the United Aircraft Corp., East Hartford, Conn.

MR. M. L. PLAT has left E. and E. Kaye, Ltd., and is now with Compagnie Française des Métaux, Castelsarrasin (Tarn-et-Garonne).

DR. J. SAWKILL has left the Tube Investments Research Laboratories to take up an appointment with Accles and Pollock, Ltd., Oldbury.

MR. R. A. SIGSBEE has been awarded the M.S. degree of the University of Michigan and has joined the technical staff of the Bell Telephone Laboratories, Laureldale, Pa.

DR. R. B. SIMS has been appointed Director in Charge of Engineering, Davy and United Engineering Co., Ltd., Sheffield.

MR. S. S. SMITH has been appointed Executive Director and General Manager of Nuclear Developments, Ltd., a company formed jointly by Imperial Chemical Industries, Ltd., Metals Division, Rolls-Royce, Ltd., and The Rio Tinto Co., Ltd., to operate in the field of civil nuclear engineering, in collaboration with the atomic power consortia.

MR. M. F. STUCHFIELD has graduated from Leeds University and taken up an appointment in the Research Department of Murex Welding Processes, Ltd., Waltham Cross.

MR. W. J. SULLY has been appointed Technical Director (Light Alloy Foundries) of Birmid Industries, Ltd., and a director of several of its subsidiaries. He has relinquished his appointment as Joint Managing Director of Sterling Metals, Ltd., but remains a director.

MR. G. V. E. THOMPSON has left the British Non-Ferrous Metals Research Association and is now practising as a space technology consultant.

DR. R. G. WARD has left Sheffield University and is now at the Department of Metallurgy and Metallurgical Engineering, McMaster University, Hamilton, Ont.

DR. L. E. WEBB has left the Fulmer Research Institute to take up an appointment as metallurgical process engineer to the Power-Gas Corp., Ltd., Stockton-on-Tees.

DR. W. W. WEBB is now at the Department of Engineering Physics, Cornell University, Ithaca, N.Y.

MR. A. G. WEHR has left the Missouri School of Mines and Metallurgy and is now in the Department of Ceramic Engineering, Mississippi State University, State College, Miss.

MR. H. L. WELSH has left for South Africa to join African French Metals South Africa (Pty.), Ltd., Olifantsfontein, Transvaal.

DR. W. M. YIM has been awarded the Doctor of Science degree by the Massachusetts Institute of Technology, and has taken up an appointment in the laboratories of the Linde Company, Tonawanda, N.Y.

Death

The Editor regrets to announce the death of:

MR. LYELL BRYANT ROBINSON, Chairman of Consolidated Zinc Corporation, Ltd., on 16 July 1961.

LETTERS TO THE EDITOR

The Improvement in Stress-Corrosion Resistance of Aluminium D.T.D. 687 Alloys

Later results on the stress-corrosion properties of D.T.D. 687 alloys treated as described in T.N. 31¹ show that the resistance of specimens corresponding to batches B and C is not significantly improved when aged for an initial period of up to 2 h. However, it has been confirmed that there is a tremendous improvement in stress-corrosion resistance for ageing beyond 5 h, reaching a maximum after 24 hours' total ageing at 150° C with little loss in tensile strength. Thus, the first two sentences of paragraph five of the note should be deleted. However, the overall conclusions and Figs. 1-3 remain unchanged.

G. THOMAS.

Dept. of Mineral Technology,
University of California,
Berkeley, Calif., U.S.A.

Reference

G. Thomas, *J. Inst. Metals*, 1960-61, **89**, (8), 287.

Properties of Magnox A.12

I should like to comment on two points in the paper on "The Creep and High-Temperature Fatigue Properties of Magnox A.12," published in the *Journal* in August, 1960.¹

1. To quote from p. 507: "Insofar as grain-boundary sliding normally plays an increasing part in the creep-deformation of material of finer grain sizes, Gifkins' hypothesis would predict more cavitation, and thereby a lower ductility, in the finer-grained Magnox A.12."

This conclusion, I think, will be true only if it is assumed that the cohesion forces between fine grains are of the same order as those between coarser grains of the same material. This, however, is not so, as the cohesion forces between fine grains are stronger than those in coarse-grained material. Under these conditions, therefore, it would require greater forces to cause cavity formation in the finer-grained material. Moreover, since it is transcrystalline slip that produces boundary "jogs", these jogs will be dependent on the number of atoms undergoing slip, which is, in turn, dependent on the grain size (and orientation). Thus, the size of cavities produced will be proportional to the grain size of the material (assuming random orientation). This accounts for the fact that, although there was more grain-boundary sliding in fine-grained material, there would still be fewer cavities per unit strain (owing to the high cohesion forces between the grains) and any cavities that had managed to form would be of smaller size. As a result, the fine-grained material would show more ductility under these circumstances.

The paragraph concludes: "...it is possible that transcrystalline slip and twinning made a greater contribution to the overall deformation of the finer-grained material."

If the finer-grained material had undergone more slip and twinning, then it would be strain-hardened to a greater extent and thus would be less ductile, but this is not the case.

2. With reference to the discussion of fatigue tests, where a greater number of cavities was found in fatigue specimens than in creep specimens at temperatures of 350° C and above, this must be attributed to the more effective cyclic stress in producing cavitation at the weakest parts of the structure, which are the grain boundaries in this case.

The larger grains, however, have greater moments (acting as cog-wheels or levers on to each other) under cyclic stresses, and so it is more likely that deformation by slip and twinning, rather than grain-boundary sliding, would take place. In fine-grained material, on the other hand, deformation by grain-boundary sliding would predominate. For this reason, I think, the grain coarsening that occurs in the temperature range 400-500° C in longer-term tests results in higher fatigue strength, as it is known that grain growth increases with increasing annealing temperature and time.

A. KHAZRAJI

Manchester College of Science and Technology,
Manchester 1.

Reference

1. P. E. Brookes, N. Kirby, and W. T. Burke, *J. Inst. Metals*, 1959-60, **88**, (12), 500.

LOCAL SECTION NEWS

Dr. J. W. Christian**Chairman, Oxford Local Section**

John Wyrill Christian was born in Scarborough, Yorks, in 1926 and educated at Scarborough High School and the Queen's College, Oxford. After graduating in physics in 1945, he worked under Dr. W. Hume-Rothery, F.R.S., on the constitution of chromium-manganese alloys, and was awarded a D.Phil. degree for his work in 1949. Under Professor Hume-Rothery's direction, Dr. Christian was responsible for the introduction of undergraduate teaching in



metallurgy at Oxford, and he has been closely associated with its development into a full Honours school. He is now George Kelley Reader in Metallurgy.

Dr. Christian's main research interests have been the crystallography of martensitic transformations, X-ray investigations of stacking faults and related phenomena, and the plastic deformation of metals. He has spent short periods as visiting professor at N.R.C., Ottawa, and the University of Illinois, Urbana, and is part-author of a book on metallurgical equilibrium diagrams. He is a member of the Metal Physics Committee of the Institute, and has also served on the Publication Committee.

NEW METHOD FOR ASSIGNING PHASE DESIGNATIONS

Proposals of an A.S.T.M. Committee

Committee E-4, on Metallography, of the American Society for Testing Materials has recently prepared a Tentative Method for Assigning Phase Designations in Metallic Systems (E157-61T).

The Institute of Metals is represented on an A.S.T.M. committee set up to study methods of presenting equilibrium data and consequently has agreed to give publicity to the Tentative Method and to invite comments and suggestions from members. The Tentative Method is accordingly reproduced in full below.

The Institute's liaison officer with the A.S.T.M. Committee is Dr. D. W. Wakeman, International Nickel Co. (Mond), Ltd., Wiggin Street, Birmingham 16, to whom comments should be sent.

A.S.T.M. Tentative Method E157-61T

Scope

1. (a) This method covers the assignment of designations for all alloy phases, based on the composition and crystal lattice of each.

(b) The method makes possible the selection of a unique designation for each phase, except that in some cases an arbitrary lower-case letter is used as described in Section 2(d) and (e).

(c) The same designation shall be used for a given phase regardless of the system in which it appears (single component, binary, ternary, or polynary).

(d) A procedure for selecting a temporary designation is also provided to cover those cases in which not enough information is available to assign the permanent designation.

Outline of Method

2. (a) Each designation consists of two parts. The first part depends upon the chemical composition and the second part depends upon the crystal structure.

(b) The first part of the designation consists of the chemical symbols of the elements necessary for the formation of the phase. These symbols are placed in parentheses in the order of decreasing atomic percentage and they are separated from each other by commas. If the phase has been proved to consist of elements in fixed stoichiometric proportions, the chemical formula can be used as the first part of the designation to indicate this fact.

(c) The second part of the designation, which is based on crystal structure, generally consists of a capital letter preceded by an arabic numeral. The capital letter shows the Bravais lattice and the numeral the number of atoms per unit cell. The following table shows the letters to be used for the various lattices:

C	= primitive cubic
B	= body-centred cubic
F	= face-centred cubic
T	= primitive tetragonal
U	= centred tetragonal
R	= rhombohedral
H	= hexagonal
O	= primitive orthorhombic
P	= body-centred orthorhombic

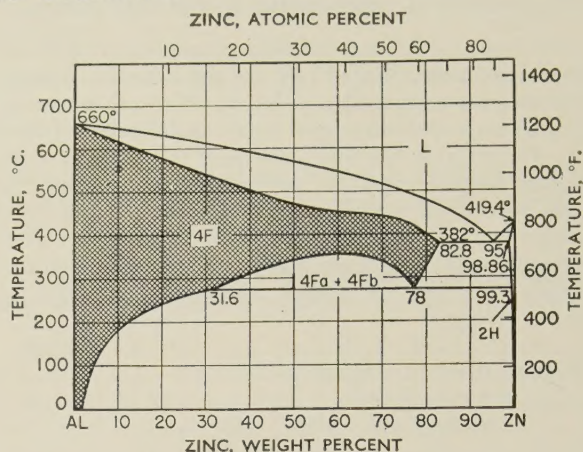


FIG. 1.—Diagram of the Al-Zn system.

Q = base-centred orthorhombic
S = face-centred orthorhombic
M = primitive monoclinic
N = centred monoclinic
Z = triclinic

The capital letters representing the different lattices are preferably printed in italics.

(d) If two phases consist of the same elements, have the same lattice, and the same number of atoms per unit cell, but different crystal structures, a lower-case letter is added immediately after the numeral (Note) to distinguish between the two phases. For example, (Se)_{32a}M designates alpha selenium, and (Se)_{32b}M beta selenium.

NOTE.—These occasional uses of the lower-case letter constitute the only arbitrary feature of the system. To avoid confusion, an author should not assign a lower-case letter to any designation without consulting the X-Ray Powder Data File * to determine what letters, if any, have already been assigned to that designation.

(e) If two phases composed of the same elements have the same crystal structure, a lower-case letter is added immediately after the upper-case letter (see Note under Paragraph (d)). For example, the two immiscible solid solutions in the aluminium-zinc system (see Fig. 1) would be designated (Al, Zn)₄Fa and (Al, Zn)₄Fb.

(f) If the atomic arrangement changes within a single-phase field (the lattice remaining the same but the number of atoms per unit cell changing), the maximum and the minimum number of atoms per unit cell are both given and separated by a hyphen. For example, 4-8F would be used for a phase having a face-centred cubic structure in which the number of atoms change across the phase field from 4 atoms per unit cell to 8 atoms per unit cell.

(g) If the crystal structure is constant over a whole phase field but one type of atom replaces another, the symbols of

* Compiled by the Joint Committee on Chemical Analysis by Powder Diffraction Methods, a joint project of the American Society for Testing Materials, the American Crystallographic Association, the (British) Institute of Physics, and the National Association of Corrosion Engineers. Information may be obtained from A.S.T.M. Headquarters, 1916 Race St., Philadelphia 3, Pa.

NEW METHOD FOR ASSIGNING PHASE DESIGNATIONS

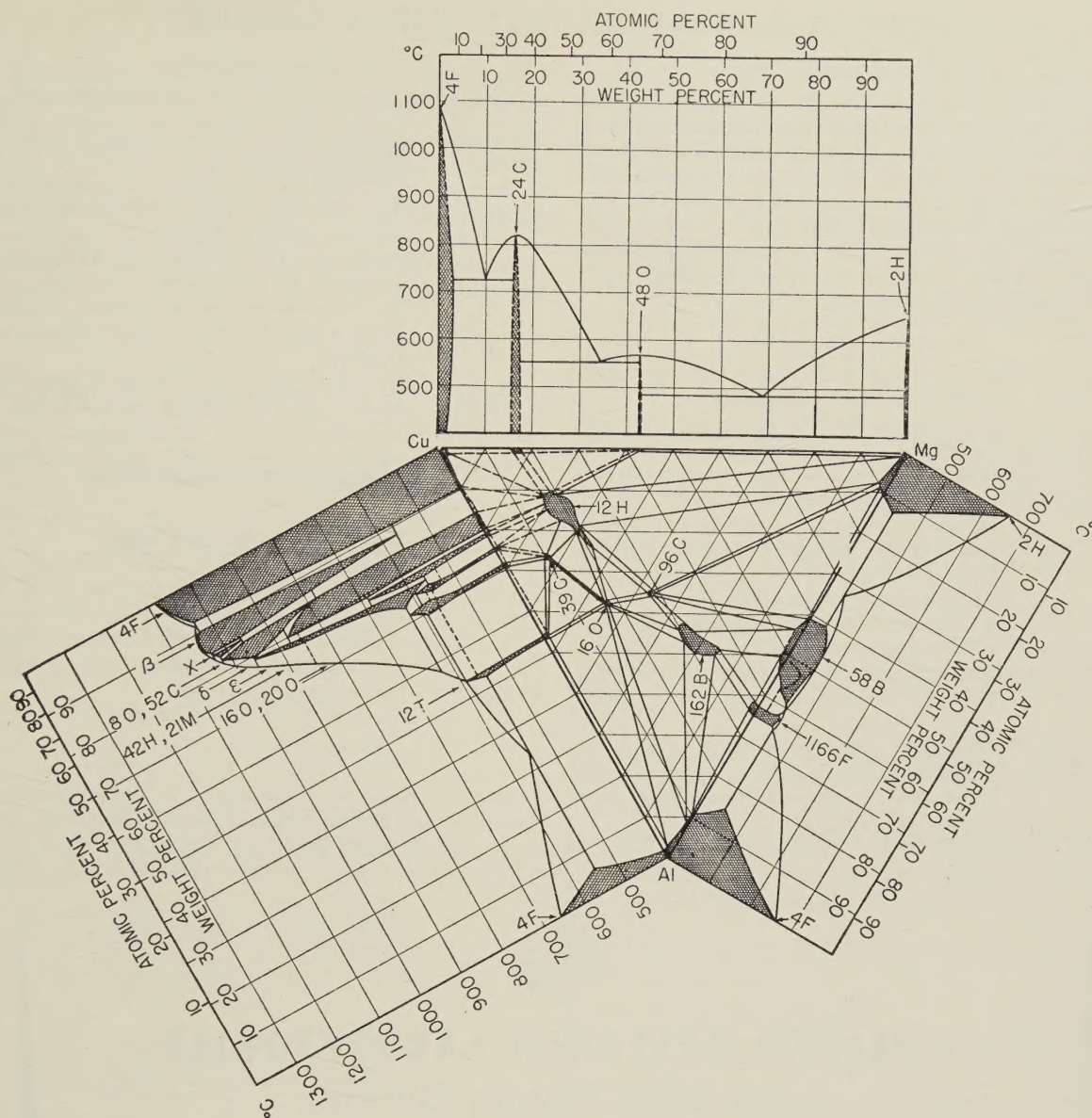


Fig. 2.—Diagram of the 400° C section of the Al-Cu-Mg system.

both elements are used and are separated by a hyphen. For example (Cu-Ni)_{4F} would be used to designate the copper end of the series of solid solutions of copper and nickel, and (Ni-Cu)_{4F} the nickel end.

(h) If two phases, one ordered and the other not, would have the same designation by application of the above rules, the ordered phase is distinguished by adding a prime mark (') to the designation.

(i) The symbols of the designation shall be set close-up, that is, there shall be no spaces in the designation.

Labelling the Fields on a Phase Diagram

3. On a phase diagram where the chemical elements entering into each phase (and their proportions) are obvious, the first part of the designation may be omitted. An example of this is the 400° C section of the Al-Cu-Mg system, shown in Fig. 2. The entire designation should be used for other

applications, such as tables of properties, etching charts, powder patterns, &c.

Temporary Designation

4. (a) If the type of lattice and the number of atoms per unit cell are unknown, a temporary designation must be used until these data have been determined. The first part of the temporary designation shall be the same as that for the permanent designation. The second part of the designation will preferably consist of a Greek letter, but an upper-case Roman letter (not those designating Bravais lattices) may be used. It is recommended that a phase, identified by its X-ray diffraction pattern, should be given the same letter regardless of the system in which it appears.

(b) As soon as the type of lattice and number of atoms per unit cell have been determined, the temporary letter shall, of course, be replaced by the permanent structure symbol.

POWDER METALLURGY JOINT GROUP

Winter Meeting, 1961

The Winter Meeting of the Powder Metallurgy Joint Group of The Iron and Steel Institute and The Institute of Metals will be held in the Hoare Memorial Hall, Church House, Great Smith Street, London, S.W.1, on 7 and 8 December 1961.

The main feature of the meeting will be a Symposium on "Sintered High-Temperature Compounds", on 8 December, between 10.0 a.m. and 5.0 p.m. The papers comprising the Symposium will all be published in *Powder Metallurgy* No. 8. Details of the programme are given below.

Thursday, 7 December

- 2.30 to 3.45 p.m. Discussion based on the undermentioned papers, published in *Powder Metallurgy*:
- "A Preliminary Study of the Reactions between Tungsten Carbide and Tungsten Carbide-6% Cobalt Powders and Wet and Dry Hydrogen", by G. E. Spriggs (No. 7).
- "An Electron-Microscope and X-Ray Investigation of the Milling of Tungsten Carbide/Cobalt Mixtures", by J. Hinnuber, O. Rüdiger, and W. Kinna (No. 8).
- 3.45 to 5.0 p.m. Discussion based on the undermentioned papers to be published in *Powder Metallurgy* No. 8:
- "Spheroidization of Irregularly Shaped Metal Powders", by M. J. Wahll, J. R. Van Orsdell, and R. B. Fischer.
- "Preliminary Observations on the Use of the Induction-Coupled Plasma Torch for the Preparation of Spherical Powder", by H. J. Hedger and A. R. Hall.
- 7.0 for 7.30 p.m. Informal Dinner at Imperial College, London, S.W.7.

Friday, 8 December

- 10.0 a.m. to 12.30 p.m. Symposium on "Sintered High-Temperature Compounds". A discussion based on the following papers to be published in *Powder Metallurgy* No. 8:
- "Hot Pressing High-Temperature Compounds", by J. S. Jackson.
- "Studies on the Sintering of $\text{MoSi}_2\text{-Al}_2\text{O}_3$ Cermets", by S. Amberg.
- "The Preparation and Properties of Self-Bonded Silicon Carbide", by P. Popper and D. Davis.
- "The Sintering of Uranium-Carbon-Iron Alloys", by M. C. Regan and J. Williams.
- 2.30 to 5.0 p.m. Symposium continued. Discussion based on the following papers to be published in *Powder Metallurgy* No. 8:
- "Dense Silicon Nitride", by G. G. Deeley, J. M. Herbert, and N. C. Moore.
- "Structural Aspects of Silicon Nitride", by N. C. Parr, R. Sands, P. L. Pratt, E. R. W. May, C. R. Shakespeare, and D. S. Thompson.
- "Mechanical Strength and Thermal Fatigue Characteristics of Silicon Nitride", by E. Glenny and T. A. Taylor.
- "Applications of Silicon Nitride", by A. M. Sage.

Copies of *Powder Metallurgy* No. 8, due for publication in November, and further details of the activities of the Joint Group are obtainable from the Secretary of the Powder Metallurgy Joint Group, 17 Belgrave Square, London, S.W.1.



MULLARD RESEARCH LABORATORIES

Solid State Physics Division

require

CHEMISTS

who are interested in applying modern instrumental methods of analysis to new and unusual materials intended for use in research on semiconductors and magnetic oxides.

The problems in this field are challenging and will make a direct appeal to the man under 30 years of age who holds an honours degree or its equivalent, and who is able to apply a sound knowledge of physics and chemistry in the development of new techniques and instrumental modifications.

In one vacancy, a knowledge of emission

spectrography and X-ray fluorescence is desirable, but some specialised training could be provided.

The Chemistry Section, which includes a radio-chemical laboratory, will be housed in a new extension with excellent supporting facilities and situated in a convenient country-side environment.

Attractive salaries with excellent conditions of employment will be offered to the candidates appointed. Applications, quoting reference KH, should be sent to—

MR. G. A. TAYLOR

MULLARD RESEARCH LABORATORIES
SALFORDS, nr. REDHILL, SURREY

OTHER NEWS

International Colloquium on Forming and Testing of Sheet Metal, 23 and 24 May 1962

Because of the success of the Colloquium on Forming and Testing of Sheet Metal held in Paris in May 1960, it is planned to hold a further meeting in Düsseldorf on 23 and 24 May 1962, under the joint ægis of the International Deep Drawing Research Group and the Verein Deutscher Eisenhüttenleute.

It is proposed to devote the open sessions of this meeting to the presentation and discussion of papers on the following two themes:

(1) Speed Effects in Sheet Metal Forming (Effect of speed of deformation in deep drawing or other sheet-forming processes; forming at very high speeds; explosive forming).

(2) The Influence of Surface Conditions on Deep Drawing (Effect of sheet metal surface, including metallic or non-metallic coatings; influence of tool surfaces; lubricants and lubrication.)

The full text of all papers accepted must be available by 15 January 1962, so that copies can be circulated to delegates well in advance of the meeting, in order to facilitate discussion.

Offers of papers or requests for further information regarding this meeting should be addressed either to Mr. John

APPOINTMENTS VACANT

METALLURGIST

required by the

**UNITED KINGDOM
ATOMIC ENERGY
AUTHORITY**

Dounreay Experimental Reactor Establishment, Thurso, Caithness, Scotland, to work in the Fuel Element Group.

Applicants must be willing to exercise their ingenuity in solving some of the problems associated with the fabrication and assembly of plutonium fuel elements for advanced nuclear reactors.

Good professional qualifications are essential, but the man for this post should possess: a fertile mind given to invention; the ability to adapt himself to ever-changing demands and difficulties; perseverance in the face of technological problems; and the flair for accomplishment.

Applicants should have at least a second-class honours degree or equivalent, have at least three years' post-graduate research experience, and be at least 26 years of age.

Salary on the scale £1440 to £1770, according to qualifications and experience.

Rented housing and house purchase assistance available for married officers living beyond daily travelling distance. Single accommodation available. Contributory superannuation.

Send postcard for application form to Personnel Manager at above address quoting Ref.: 264/1081.

MILL SUPERINTENDENT

Fully experienced operative Mill Superintendent required by Company operating in CYPRUS to superintend mill plant for treating copper pyrites ore by selective flotation, producing copper concentrates and pyrites. Two-year tour with three months' leave on full pay. Passages paid, free housing, medical attention. No educational facilities for children. Applications, giving details age, experience, and personal information in strictest confidence, to Box 439, c/o Walter Skinner, Ltd., 20, Copthall Avenue, London, E.C.2, England.

POWDER METALLURGY

Due to continued expansion, an engineering company in Coventry, of a world-wide concern, requires to fill the following vacancies in connection with development work on the fabrication of parts by powder-metallurgy methods, including cermets and high-temperature pressings:

- (a) A graduate is required with a good theoretical background and some research experience. A genuine interest in development work is essential.
- (b) This post requires a man who has experience of powder metallurgy and who is capable of undertaking control of a small production unit in addition to assisting in development work.

Salaries will be commensurate with experience and qualifications. There is a contributory pension scheme and the usual social and welfare amenities in operation.

Applicants should state clearly for which post they are applying and give details of age, qualifications, and experience, which will be treated in confidence, to Box No. 464, The Institute of Metals, 17 Belgrave Square, London, S.W.1.

SCIENTIFIC POSTS IN COPPER AND COPPER ALLOY PRODUCTION

The following posts are open at a large works situated in rural surroundings in N. Midlands and in spacious and well-equipped laboratories:

SENIOR METALLURGIST

To be responsible for the day-to-day metallurgical activities of research and control laboratories employing fifty people.

Applicants must be over 30 years of age, have had both research and works' experience, preferably, but not necessarily, of wrought copper and copper alloys, and must be able to organize methods, control staff, and initiate and progress research and development work in conjunction with works' personnel.

METALLURGIST

To engage in research and development work in conjunction with works' personnel and cope with short-term works' and customers' problems. Age 25-35.

ASSISTANT METALLURGIST

A recently qualified man is wanted with an interest in, and a capacity for, the application of his knowledge to works' problems.

CHEMIST

A qualified man, aged 25-35, with an interest in works' problems and able to co-operate at all levels. A knowledge of organic chemistry would be considered an additional asset.

The Company offers good conditions of employment and applications, which will be regarded as strictly confidential, should be addressed to Box 465, The Institute of Metals, 17 Belgrave Square, London, S.W.1.

Hooper, Secretary, I.D.D.R.G., John Adam House, John Adam Street, Adelphi, London, W.C.2, or to Geschäftsführung des Vereins Deutscher Eisenhüttenleute, Düsseldorf, Breite Str. 27.

Conference on "International Developments in Heat Transfer"

A Conference on "International Developments in Heat Transfer" is to be held in London on 8-12 January 1962. The conference, which is being arranged jointly by the Institution of Mechanical Engineers, the American Society of Mechanical Engineers, and the Institution of Chemical Engineers, will be on the same lines as the conference recently held in Boulder, Colo.

The basis of the conference will be papers dealing with the fundamental aspects of heat transfer. There will, however, also be papers dealing with technology and others covering such fields as nuclear energy and aeronautical sciences. In all 124 papers will be presented.

A programme of the conference, with registration form,

may be obtained from the Secretary, The Institution of Mechanical Engineers, 1 Birdcage Walk, London, S.W.1.

Symposium on "Some Aspects of Vacuum Science and Technology"

The Institute of Physics and the Physical Society are holding a one-day symposium on "Some Aspects of Vacuum Science and Technology", at the Imperial College of Science and Technology, London, S.W.7, on 5 January 1962.

The scope of the symposium will be: (a) continuously exhausted bakeable vacuum apparatus for pressures below 10^{-9} mm of mercury and (b) the controlled deposition of evaporated film.

Further details and application forms will be available about the end of October 1961, from the Administration Assistant, The Institute of Physics and The Physical Society, 47 Belgrave Square, London, S.W.1.

Conference on "Imperfections in Crystals"

"Imperfections in Crystals" is the theme of the autumn conference of the X-Ray Analysis Group of the Institute of Physics and the Physical Society, to be held on 17 and 18 November 1961 at the Institution of Mechanical Engineers, 1 Birdcage Walk, London, S.W.1.

There will be three sessions, dealing with: (i) the nature of crystal imperfections and of associated diffraction effects, (ii) experimental methods for studying imperfections, and (iii) the influence of imperfections on the physical properties of crystals.

Further information may be obtained from the Institute of Physics and the Physical Society, 47 Belgrave Square, London, S.W.1.

Conference on "Crystal Lattice Defects"

An International Conference on Crystal Lattice Defects, organized by the Physical Society of Japan, will be held in Kyoto, Japan, on 7-12 September 1962. Further information may be obtained from Professor R. R. Hasiguti, Department of Metallurgy, University of Tokyo, Bunkyo-ku, Tokyo.

COMMONWEALTH OF AUSTRALIA



DEFENCE STANDARDS LABORATORIES

ELECTRODEPOSITION

The Department of Supply invite applications for the following permanent position at the Defence Standards Laboratories, MELBOURNE.

POSITION: HIGHER SCIENTIFIC OFFICER.

SALARY: £2036/2296 (Australian Currency).

DUTIES: Research in the field of electrodeposition. This includes studies on electrode reactions, structures and properties of electrodeposits, alloy deposition and electro-winning of pure metals.

QUALIFICATIONS: Appropriate Honours Degree with Chemistry or Metallurgy as the major subject.

CONDITIONS: The position offers permanent appointment to the Commonwealth Public Service and participation in the Commonwealth Superannuation Scheme on confirmation of appointment. Under certain conditions air/sea transport for the appointee and dependants (wife and dependant children) will be provided by the Commonwealth.

Alternatively, consideration may be given to a three (3) or five (5) year contract of employment in Australia. In this case the Commonwealth will bear the cost of return fares, together with the cost of removing the successful applicant's furniture and effects up to a maximum cost of £500 (Australian), £250 each way.

APPLICATIONS: Forms obtainable from Senior Representative (AV.122/7), Department of Supply, Australia House, Strand, London, W.C.2, with whom completed applications should be lodged as soon as possible.

BABCOCK & WILCOX, LTD.

ATOMIC ENERGY DEPARTMENT

require a

METALLURGIST

for interesting and progressive work in their London Office on the selection and application of ferrous and non-ferrous materials, particularly in the cores of water- and gas-cooled nuclear reactors. Applicants would be expected to collaborate closely with the Company's Metallurgical and Research Departments in Scotland, have a degree or its equivalent, and two or three years of industrial experience in the field of selection of non-ferrous materials.

★

Applications should be made to:—

The Assistant Secretary,
Babcock & Wilcox, Limited,
209, Euston Road,
London, N.W.1.

DIARY

Local Sections and Associated Societies

- 3 October. **Oxford Local Section.** "High-Temperature Alloys", by Dr. W. Betteridge. (Cadena Café, Cornmarket Street, Oxford, at 7.15 p.m.)
- 5 October. **Leeds Metallurgical Society.** "The Strength of Alloys", by Professor R. W. K. Honeycombe. (University Staff House, University Road, Leeds, at 6.30 p.m.)
- 5 October. **London Local Section.** "Plutonium", by W. B. H. Lord (17 Belgrave Square, London, S.W.1, at 6.30 p.m.).
- 9 October. **Oxford Local Section.** Annual Dinner (St. Edmund Hall, Oxford).
- 9 October. **Scottish Local Section.** "Physical Methods of Analysis for Major Alloying Constituents", by K. M. Bills. (Institution of Engineers and Shipbuilders, Elmbank Crescent, Glasgow, C.2, at 6.30 p.m.)
- 9 October. **Tyne Wear Metallurgical Association.** "Modern Developments in Steelmaking", by J. Pears. (Metallurgy Department, King's College, Haymarket, Newcastle-upon-Tyne, at 6.30 p.m.)
- 10 October. **South Wales Local Section.** "Welding of Non-Ferrous Metals", by J. G. Young. (Metallurgy Department, University College, Swansea, at 6.30 p.m.)
- 11 October. **Manchester Metallurgical Society.** Presidential Address, by W. L. Harper (Manchester Literary and Philosophical Society, George Street, Manchester, at 6.30 p.m.).
- 12 October. **Birmingham Local Section.** "Some Problems in the Development of Fuel Cells", by A. D. S. Tantram (College of Advanced Technology, Gosta Green, Birmingham 4, at 6.30 p.m.).

- 12 October. **East Midlands Metallurgical Society.** "Some Aspects of Metallurgical Training". (Derby and District College of Art, Derby, at 7.30 p.m.)
- 12 October. **Liverpool Metallurgical Society.** Presidential Address: "Metallurgy and the Craftsman", by F. R. Brace. (Department of Metallurgy, The University, Liverpool 3, at 7.0 p.m.)
- 13 October. **West of England Metallurgical Society.** "Creep: The Potential Influence of Theory in Practice", by Dr. D. McLean. (The College of Technology, Ashley Down, Bristol 7, at 7.30 p.m.)
- 17 October. **North East Metallurgical Society.** "Causes and Prevention of Service Failure in Railway Equipment", by J. Dearden. (Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough, at 7.30 p.m.)
- 18 October. **Liverpool Metallurgical Society.** Visit to Grayson, Rollo, and Clover Docks, Ltd., Birkenhead Works.
- 19 October. **Sheffield Local Section.** Film Evening. (Applied Science Building of the University, St. George's Square, Sheffield, at 7.30 p.m.)
- 25 October. **Manchester Metallurgical Society.** "Education in the Metallurgical Field". General discussion introduced by L. W. Derry, Professor H. O'Neill, and D. R. O. Thomas. (Manchester Literary and Philosophical Society, George Street, Manchester, at 6.30 p.m.)

UNITED KINGDOM
ATOMIC ENERGY AUTHORITY

require a

METALLURGIST

to assist plant managers in the production of various components using fissile materials. The successful applicant will spend an initial period in a central technical records office as part of his management training during which time he will be engaged in fissile material control, allocation, and progressing.

Candidates should possess an Honours Degree, A.I.M., or equivalent qualification, and should have knowledge of one or more of the following:

- (i) Radioactive materials and processes.
- (ii) Metallurgical production processes.
- (iii) Material control procedures.

SALARY: £1,005 (age 25)—£1,350 (age 34 or over)—£1,535 p.a.

Superannuation scheme. A house or substantial assistance with house purchase will become available for married officers living beyond daily travelling distance.

Please write for application form to the Senior Recruitment Officer, A.W.R.E., Aldermaston, Berks., quoting ref. 2962/228.

THE JOURNAL OF

***The British Nuclear
Energy Conference***

JANUARY—APRIL—JULY—OCTOBER

The Journal contains Papers and Discussions on the applications of nuclear energy and ancillary subjects

The OCTOBER issue will include all the papers in the Symposium on Secondary Surfaces for Heat Transfer.

The July issue contained

- The Dounreay Fast Reactor Symposium Papers,
- A Paper on Pressure Vessels for Gas-cooled Graphite-moderated Reactors.

Annual Subscription: 30s. to members of the following Societies—

Institution of Civil Engineers Institution of Mechanical Engineers
Institution of Electrical Engineers Institute of Physics and the
Physical Society Institution of Chemical Engineers Iron and
Steel Institute Institute of Metals Institute of Fuel The
Joint Panel on Nuclear Marine Propulsion

—to all others: £3.

Full particulars are available from:

**The Secretary, B.N.E.C., 1-7 Great George St.,
London, SW1.**

- 26 October. Birmingham Local Section.** Presidential Address to the Birmingham Metallurgical Society, by S. Heslop. (College of Advanced Technology, Gosta Green, Birmingham 4, at 6.30 p.m.)
- 26 October. Southampton Metallurgical Society.** "Metallurgy of Uranium", by Dr. J. J. Stobo. (Southampton University, at 7.15 p.m.)
- 1 November. Manchester Metallurgical Society.** "Problems Associated with the Welding of Heavy Sections", by A. F. Gifford (Joint meeting with the Institute of Welding (Manchester and District Branch)). (Manchester Literary and Philosophical Society, George Street, Manchester, at 7.15 p.m.)
- 2 November. Leeds Metallurgical Society.** Joint meeting in Leeds with the Institution of Metallurgists (details to be announced).
- 2 November. London Local Section.** "The Design of Strong Materials", by Professor A. H. Cottrell. (Royal School of Mines, London, S.W.7, at 7.0 p.m.)
- 7 November. Oxford Local Section.** "Bearing Metals", by P. G. Forrester. (Cadena Café, Cornmarket Street, Oxford, at 7.15 p.m.)
- 7 November. South Wales Local Section.** Discussion on "Extrusion" introduced by Professor A. R. E. Singer and R. Cox. (Joint Meeting with the Swansea and District Metallurgical Society.) (College of Technology, Swansea, at 6.30 p.m.)
- 9 November. Birmingham Local Section.** "The Welding of Metals", by D. R. Thorneycroft. (College of Advanced Technology, Gosta Green, Birmingham 4, at 6.30 p.m.)
- 9 November. East Midlands Metallurgical Society.** "Electron-Beam Welding", by M. Harper. (Faculty of Applied Science, Clifton Boulevard, The University, Nottingham, at 7.30 p.m.)
- 9 November. Liverpool Metallurgical Society.** "Metallurgical Aspects in the Development of Fast Fission Reactors", by Professor C. R. Tottle. (Department of Metallurgy, The University, Liverpool 3, at 7.0 p.m.)
- 9 November. Southampton Metallurgical Society.** Evening visit to Folland Aircraft, Ltd.
- 13 November. Scottish Local Section.** "The Effects of Irradiation on Materials", by Dr. H. M. Finnieston. (Institution of Engineers and Shipbuilders, Elmbank Crescent, Glasgow, C.2, at 6.30 p.m.)
- 13 November. Tyne Wear Metallurgical Association.** Annual Dinner.
- 14 November. West of England Metallurgical Society.** Open discussion on: "Teaching Metallurgy to Metallurgists and Engineers", led by Professor J. G. Ball and L. W. Derry. (The College of Technology, Ashley Down, Bristol 7, at 7.30 p.m.)

ZEITSCHRIFT FÜR METALLKUNDE

published by the Deutsche Gesellschaft für Metallkunde e.V. is the leading technical journal in Germany for the entire metal-producing and metal-working industry.

With original papers on scientific and technical problems submitted from metallurgical plants and the metal-ware and semi-finished product industry, as well as from national and foreign research institutes, it covers the fields of metallurgy working, and material testing.

Published monthly

Price per issue DM 7.60

Annual Subscription (12 issues) DM 86.40 Postage and packing extra

DR. RIEDERER-VERLAG G.m.b.H., STUTTGART - GERMANY